UNITED STATES PATENT AND TRADEMARK OFFICE

Application No.:	10/580,890	**Confirmation Number:**	7135
Applicant:	Sun Yang Kook, *et al.*		
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Commissioner for Patents
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DECLARATION UNDER 37 C.F.R. § 1.132

I, Yang Kook SUN, declare as follows:

1. I am a co-inventor of U.S. Patent Application Serial No. 10/580,890 (hereinafter '890), which received a filing date of May 25, 2006.

2. I have worked in the field(s) of Chemical Engineering for approximately fifteen years. My educational background includes a Bachelor of Science Degree in Chemical Engineering from ChonNam University in 1985; and the degree of Doctor of Philosophy in Chemical Engineering from Seoul National University in 1992.

3. I am familiar with and have knowledge in the field of chemical engineering, and worked as a researcher at Samsung Heavy Industries Company Ltd. (1992-1996) and Samsung Advanced Institute of Technology (1996-2000). I am currently a professor at the Department of Materials and Engineering of Hanyang

University (since 2000). In particular, I have been involved with research with respect to rechargeable batteries for approximately twelve years.

4. I have reviewed and am familiar with U.S. Patent Application Publication 2007/0111098 (hereinafter referred to as "Sun"), which is the pre-grant publication of the '890 Application. I am also familiar with the claims that are currently pending in the '890 Application.

5. I have reviewed and am familiar with U.S. Patent Application Publication 2003/0170540 (hereinafter referred to as "Ohzuku"). I understand that Ohzuku discloses two different reactor designs which can be used in the production of a positive electrode active material via co-precipitation methods. These designs are schematically illustrated in Figures 1 and 4 of Ohzuku. See Ohzuku at ¶¶ **[0046]** and **[0049]**.

6. I prepared, or supervised the preparation of, a coin battery using the conditions described as "Example 1" in ¶¶ **[0058]** – **[0061]** of Sun. However, instead of using the reactor illustrated in Figure 1 of Sun, the reactor schematically illustrated in Figure **4** of Ohzuku was substituted. This reactor includes two baffles and a rotary vane agitator configured to induce a **upward** fluid flow within the reactor. The preparation of the coin battery under the conditions described in this Paragraph will be referred to herein as "Experiment A".

7. I repeated, or supervised the repetition of, Experiment A, except that the rotary vane agitator was replaced with a reverse rotary vane agitator, such as that described in ¶ **[0033]** and illustrated in Figure 1 of Sun. The reverse rotary vane agitator includes a first set of vanes configured to produce downward fluid flow, and a second set of vanes configured to produce upward fluid flow. This reverse rotary vane agitator is configured to enhance uniform mixing of fluid in the upper and lower parts of the reactor. The preparation of the coin battery under the conditions described in this Paragraph will be referred to herein as "Experiment B".

8. The characteristics of the coin batteries prepared in Experiments A and B were evaluated at a range of voltages between 2.8 V and 4.3 V using an electrochemical analyzer (Toscat 3100U, Toyo System Co., Ltd.). Attached to this Declaration as Exhibit A are charge/discharge curves per unit mass of cathode active material in these coin batteries.

9. The charge/discharge curves shown in Exhibit A illustrates that the cathode active material produced according to Experiment B—that is, using a reverse rotary vane agitator—has a charge/discharge capacity that is approximately 10 mAh g^{-1} greater than the cathode active material produced according to Experiment A. This is a significant difference that has great industrial value in the field of battery design.

10. Because the only parameter that was changed between the Experiments A and B was the configuration of the agitator, the logical conclusion is that the improved charge/discharge capacity illustrated in Exhibit A is due to the use of the reverse rotary vane agitator in Experiment B. At the time of the invention disclosed in Sun, it was unexpected that such superior properties could be achieved by only modifying the agitator vane configuration.

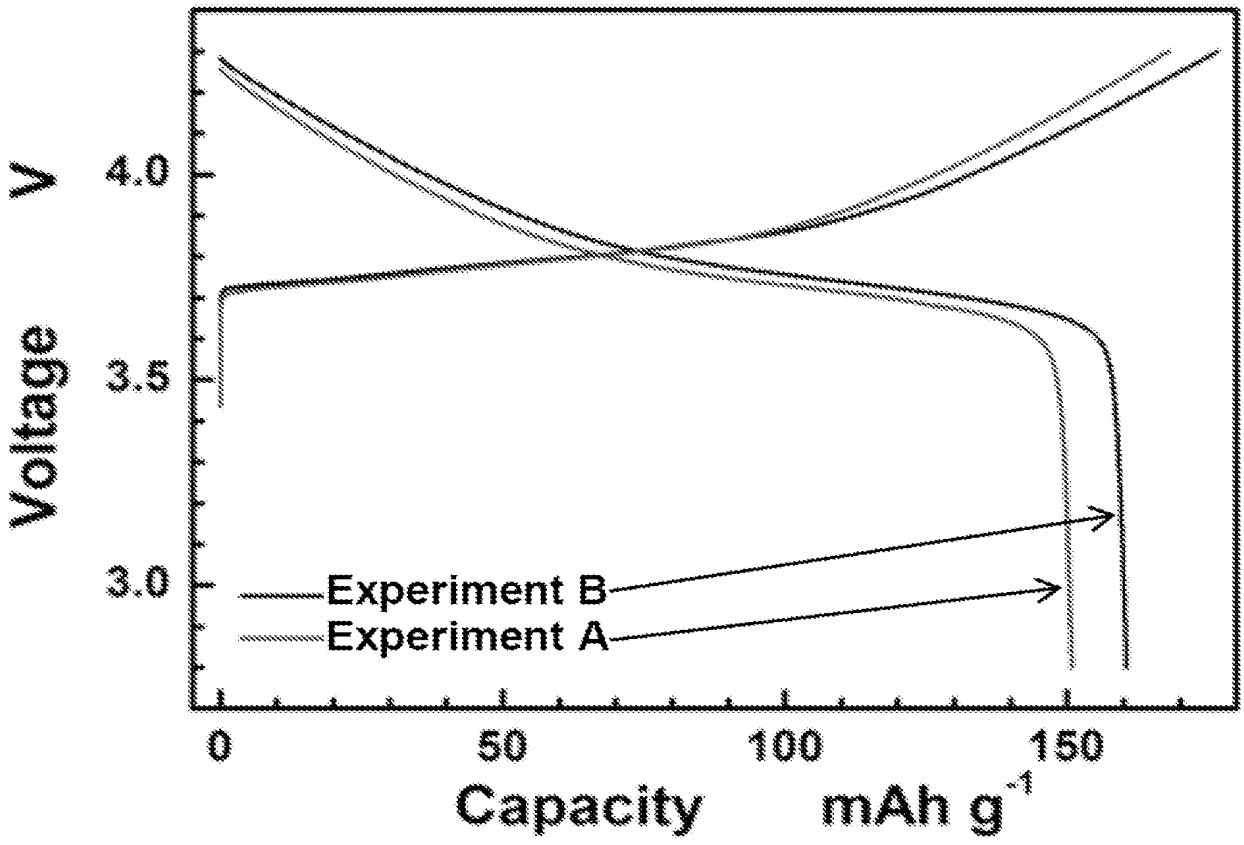
11. It would not be possible to replicate the results obtained by using a reverse rotary vane agitator (such that that used in Experiment B) by somehow using **both** the downward flow reactor illustrated in Figure 1 of Ohzuku **and** the upward flow reactor illustrated in Figure 4 of Ohzuku. That is, the precipitation process should be carried out in a **single** reactor.

12. All statements made herein that are of my own knowledge are true. All statements made herein on information and belief are believed to be true. All statements made herein are made with the knowledge that (a) willful false statements and the like, so made, are punishable by fine or imprisonment, or both, under 18 U.S.C. § 1001, and (b) such willful false statements may jeopardize the validity of this application or any patent issuing therefrom.

Yangkook Sun June 16, 2011

[Yang Kook Sun] Date

EXHIBIT A


Voltage
V
4.0
3.5
3.0
Experiment B
Experiment A
0
50
100
150
Capacity mAh g-1